REMARKS

In the Office Action mailed April 26, 2007, claims 1-9, 12, 14-18 and 20-67 were rejected, and claims 10, 11 and 19 were objected to. Claims 34-66 were rejected under 35 U.S.C. §101 as not being patent eligible for failing to produce a real life, real world, useful, concrete and tangible result. Claims 1-4, 6-9, 12, 15-18, 20, 21, 34-37, 39, 40, 45, 46, 48-51, 53, 54 and 67 were rejected under 35 U.S.C. §102(a) as being anticipated by Dister et al. (U.S. Pat. No. 6,053,047). Claims 1, 2, 4-9, 14-18, 20-28, 30-35, 37-41, 47-51, 53-61 and 63-66 were rejected under 35 U.S.C. §102(a) as being anticipated by Cusumano et al. (U.S. Pat. No. 6,567,752). Claims 29 and 62 were rejected under 35 U.S.C. §103(a) as being obvious over Cusumano et al. in view of Discoenzo (U.S. Pat. No. 6,847,854). Claims 10, 11 and 19 were objected to as depending from a rejected base claims, but were indicated to be allowable if rewritten in independent form.[1]

Claim Objections

Claims 10, 11 and 19 were objected to as depending from a rejected base claims, but were indicated to be allowable if rewritten in independent form. The allowability of those claims is acknowledged.[2] However, as detailed below, it is believed that amended independent claim 1, from which claims 10, 11 and 19 depend, is now in condition for allowance. Therefore, it is believed that dependent claims 10, 11 and 19 are allowable in their current form along with amended independent claim 1. Notification to that effect is requested.

Claim Rejections - 35 U.S.C. §101

Claims 34-66 were rejected under 35 U.S.C. §101 as not being patent eligible for failing to produce a real life, real world, useful, concrete and tangible result. With the present amendment,

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[1]On page 13 of the Office Action, it is indicated that claim 12 would be allowable. However, that statement is believed to be a typographical error because dependent claim 12 is elsewhere rejected.

[2]It should be noted that page 9 of the Office Action includes the sentence fragment "which one of said electromagnetic proximeter is disposed. (Refer to FIG. 2)" with regard to the Cusumano et al. reference. It is believed that this is a typographical error, because that sentence fragment is unrelated to other text on that page of the Office Action. FIG. 2 of Cusumano et al. discloses a strain gauge 220, but does not disclose an electromagnetic proximeter.

independent claim 34 had been amended to recite "outputting the assessment of operational heath". This language explicitly clarifies that the claimed method produces a tangible result, namely an output of the assessment of operational health. Claims 35-66 depend from amended independent claim 34 and include all of the limitations of that base claims. Thus, all of claims 34-66 are patent eligible, and the rejections under §101 should be withdrawn. Notification to that effect is requested.

Claim Rejections - 35 U.S.C. §102(a)

Claims 1-4, 6-9, 12, 15-18, 20, 21, 34-37, 39, 40, 45, 46, 48-51, 53, 54 and 67 were rejected under 35 U.S.C. §102(a) as being anticipated by Dister et al. (U.S. Pat. No. 6,053,047).

Amended independent claim 1 relates to a system for monitoring rotating machinery, and requires a plurality of proximeters positioned proximate to the rotating machinery and each being operable to measure and transmit resonant vibration frequency and bending amplitude data for the rotatable machinery derived from a transit time between individual rotating extensions of the rotating machinery, along with distance data derived from signal amplitude data for a proximeter signal. According to amended independent claim 1, the plurality of proximeters are positioned so as to enable mapping of a resonance period of the rotating machinery.

Amended independent claim 34 relates to a method for monitoring rotating machinery, and requires positioning a plurality of proximeters proximate to the rotating machinery, where the proximeters are each operable to measure and transmit resonant vibration and bending amplitude data for the rotating machinery derived from a transit time between individual rotating extensions of the rotating machinery, along with distance data derived from signal amplitude data for a proximeter signal. The method of amended independent claim 34 includes receiving and correlating said data using a processor that is electrically coupled to said plurality of proximeters to map a resonance period of the rotating machinery and produce an assessment of operational health for the machinery based on the measurements using the processor.

Amended independent claim 67 relates to a system for monitoring rotating machinery, and requires a plurality of proximeters positioned proximate to the rotating machinery and each being operable

to measure and transmit resonant vibration frequency and bending amplitude data for the rotatable machinery derived from a transit time between individual rotating extensions of the rotating machinery, along with distance data derived from signal amplitude data for a proximeter signal. According to amended independent claim 67, the plurality of proximeters are selected from the group consisting of electromagnetic proximeters and capacitive proximeters.

It is important to note that currently amended independent claims 1, 34 and 67 each require proximeters that are each operable to measure and transmit two types of data: (a) resonant vibration and bending amplitude data derived as a function of a transit time between individual rotating extensions of the rotating machinery and (b) distance data derived from signal amplitude data for a proximeter signal. Independent claims 1, 34 and 67 have both been amended to further clarify that resonant vibration and bending amplitude data relates to a characteristic of the rotating machinery derived in the time domain, while the distance data derived from the signal amplitude data, in contrast, is produced when the proximeter signal is sensed to detect relative positioning between a proximeter and the rotating machinery at a given instant. Resonant vibration data of the rotating machinery, including both machinery vibration frequency and machinery vibration bending amplitude, is derived in the time domain from transit time data, which can be derived from the transit time between a given set of individual rotating extensions of the rotating machinery as they rotate. (Specification, ¶¶22-24 and 28). This data is related not to the rotating machinery generally, but specifically to individual rotating extensions of that rotating machinery. For example, the vibration data can relate to measurements between different teeth of a gear. The distance data, on the other hand, is derived from signal strength (i.e., amplitude) from a proximeter signal, such as a proximeter signal amplitude measurement in millivolts. (Specification, ¶29). Both types of data are utilized according to the present invention. (Specification, ¶30; FIG. 4).

Dister et al. discloses a diagnostic system for determining faults in multiple bearings using a sensor. Dister et al. discloses that vibration in a machine can be produced by bearings and misalignment or imbalance of gears rotors and fans. (Dister et al., col. 1, ll. 37-39). Dister et al. discloses a machine

diagnostic system for sensing vibration signatures of two or more bearings having unique vibration signatures. (Dister et al., col. 2, ll. 56-62; col. 4, ll. 50-54; col. 5, ll. 6-10 and 33-49). The system of Dister et al. includes at least one vibration sensor, which can be accelerometers or proximity detectors. (Dister et al., col. 6, line 60 to col. 7, line 6; FIG. 2). Dister et al. further discloses a host computer 66 and a processor 90, which can analyze data from the sensor and make a determination of a health of a machine for maintenance scheduling and failure prediction. (Dister et al., col. 8, ll. 58-65; col. 9, ll. 58-65; col. 11, ll. 17-28; col. 12, ll. 22-26; FIGS. 5 and 6). However, Dister et al. discloses only measurements of mechanical vibrations in the over time, not in real time. (Dister et al., col. 7, ll. 37-50; col. 10, ll. 2-13 and 52-67; FIGS. 6-8). Moreover, Dister et al. discloses that bearing degradation is measure by comparing vibration amplitude peaks to known values for healthy components to enable identification of performance degradation at a particular bearing set. (Dister et al., col. 10, ll. 1-67; FIGS. 6-8).

Dister et al. fails to show, teach or disclose each and every element of amended independent claims 1, 34 and 67, because Dister et al. does not measure and transmit (a) resonant vibration and bending amplitude data <u>derived as a function of a transit time between individual rotating extensions of rotating machinery</u> or (b) <u>distance data derived from signal amplitude data for a proximeter signal</u>. First, although Dister et al. does collect resonant vibration and amplitude data, that data is not derived as a function of a transit time between individual rotating extensions of rotating machinery. Rather, Dister et al. is primarily directed at the use of accelerometers as sensors, and accelerometers do not derive resonant vibration and bending amplitude data as a function of a transit time between individual rotating extensions of rotating machinery as required by the present claims. Dister et al. has a different configuration and operates in a different manner. Indeed, as noted in the present application, accelerometers have been conventionally used, but such equipment in inadequate for many high-speed applications, and lack the ability to measure gear data in real time. (Specification, ¶¶4 and 5; see also ¶¶36-60 and FIG. 5). This is unsurprising, as the system and method of Dister et al. is directed primarily to analysis of bearing sets rather than gears. In order to reject a claim under 35 U.S.C. §102, the identical invention must be shown

in a reference in as complete detail as is contained in the claim. M.P.E.P. 2131, *citing Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236 (Fed. Cir. 1989). Although Dister et al. further mentions gears and proximity sensors, these passing references fail to disclose the detail recited in the present claims and fail to enable the presently-claimed invention.

Second, Dister et al. does not collect distance data derived from signal amplitude data for a proximeter signal. The present invention relates to the collection of data in ways not contemplated by Dister et al. This is data that goes beyond the frequency and amplitude data analyzed by Dister et al. Distance data derived from signal amplitude data for a proximeter signal allows operational health assessments not possible with the system of Dister et al. For example, radial runout or axial movement (e.g.., axial runout) are not possible with the system of Dister et al. In contrast, the present invention allows detection of resonant frequencies as well as deflections or movements. (See, e.g., steps 33 and 34 in FIG. 4 of the present application)

In addition, amended independent claim 67 has presently been amended to incorporate the limitations of dependent claims 10 and 11 as a Markush group while eliminating some other elements previously included in the Markush group. Claims 10 and 11 were indicated to be allowable in the Office Action, and therefore amended independent claim 67 is likewise in condition for allowance.

Thus, Dister et al. fails to show, teach or disclose each and every limitation of amended independent claims 1, 34 and 67, and the rejections of those claims under §102(a) should be withdrawn. Notification to that effect is requested.

Claims 2-4, 6-9, 12, 15-18, 20, and 21 depend from amended independent claim 1 and include all of the limitations of that base claim, and claims 35-37, 39, 40, 45, 46, 48-51, 53 and 54 depend from amended independent claim 34 and include all of the limitations of that base claim. Therefore, dependent claims 2-4, 6-9, 12, 15-18, 20, 21, 35-37, 39, 40, 45, 46, 48-51, 53, 54 and 67 are likewise allowable over Dister et al. for the reasons given above with respect to amended independent claims 1 and

34. In addition, Dister et al. fails to show, teach or disclose many limitations recited in the pending dependent claims. The following are some examples.

With regard to claims 4 and 37, Dister et al. fails to show, teach or disclose resonant vibration data that includes radial runout data for a shaft having circumferentially disposed extensions, where the resonant vibration data is derived from transit times between individual rotating extensions. The term "radial runout" means variation in a direction perpendicular to the axis of rotation of an indicated surface from a plane surface of revolution. To the extent that the definition given on page 4 of the Office Action implies that geometric tolerances are the only cause of radial runout, that definition is unnecessarily limiting. For example, a lack of concentricity (a parameter not strictly confined to geometric tolerances such as radius or circumference) can cause radial runout problems for a gear mounted on a shaft. Moreover, a imbalance (e.g., due to worn bearings supporting the shaft) could cause deflection of a shaft installed in a gearbox and produce radial displacement of a rotating gear mounted on the shaft. (See specification ¶31). One explanation for the fact that Dister et al. fails to discuss runout is the fact that Dister et al. does not measure distance data. The Office Action cites a passage of Dister et al. that deals with processing and analyzing vibration signals. However, that cited disclosure is insufficient to anticipate the present claims because nowhere does Dister et al. discuss measuring and transmitting runout or any equivalent parameters. Thus, the rejections of dependent claims 4 and 37 over Dister et al. should be withdrawn. Likewise, Dister et al. fails to show, teach or disclose runout data as required by dependent claims 5, 6, 38 and 39.

Regarding dependent claims 7-9, and 40-42, Dister et al. does not disclose measurement, transmittal or correlation involving axial movement data, which can be axial runout data, shaft elongation data, or other data indicative of axial fluctuations in position. Such movement data is distinguishable from mere vibration data of the kind disclosed by Dister et al. Indeed, Dister et al. primarily discusses bearing sets that are not typically prone to axial movement like shafts, gear and other components.

Regarding dependent claims 12, 45 and 46, Dister et al. fails to disclose optical or fiber optical proximeters. Instead, Dister et al. discloses a vibration sensor that is an accelerometer 80 that sends

electrical signals to a diagnostic module 44 "via suitable connections such as a signal-bearing wire or optical fiber." (Dister et al., col. 7, ll. 37-40). Elsewhere Dister et al. discloses that proximity sensors can be substituted for accelerometers. (Dister et al., col. 6, ll. 60-66). However, the connection wire or cables between a sensor and an other location are distinguishable from the type of sensor. Dister et al. therefore fails to disclose optical or fiber optical proximeters. Thus, the rejections of dependent claims 12, 45 and 46 over Dister et al. should be withdrawn.

Regarding dependent claim 16, Dister et al. fails to show, teach or disclose proximeters oriented at about 90° to each other. Providing proximeters that are, for example, radially and axially oriented with respect to an axis of rotation of machinery facilitates monitoring desired operational health characteristics. (See, e.g., specification, ¶¶ 22, 23, 28, 41; FIGS. 1, 3a, 3b, 10). The Office Action does not provide any *prima facie* basis for such a disclosure by Dister et al. Rather, the Office Action discusses "a gearbox comprising a gear having multiple teeth," which is not a limitation found in dependent claim 16. Thus, the rejection of dependent claim 16 over Dister et al. should be withdrawn.

Regarding dependent claims 17 and 50, Dister et al. fails to show, teach or disclose a proximeter disposed at a location approximately 180° from a meshing point of two gears. Dister et al. does not show, teach or disclose the particular locations of proximeters in relation to rotating machinery required by those claims. The portions of the Dister et al. reference cited in the Office Action fail to disclose the relevant claim language. Rather, Dister et al. discloses that vibration *sources* may be "gears", but only discloses locating vibration *sensors* relative to bearing sets. (See Dister et al., col. 1, ll. 38-40; col. 2, ll. 56-60; col. 4, ll. 64-67). It should be understood that vibration sources may be located nearly anywhere in a machine, and can transmit vibrations to components of interest. The present claims do not relate to vibration sources but rather to the location of sensors. Thus, the rejections of dependent claims 17 and 50 over Dister et al. should be withdrawn.

Regarding dependent claim 49, Dister et al. fails to show, teach or disclose assessing operational health of each tooth of a gear having multiple teeth. Dister et al. discusses identifying faulty

bearing sets, but the present invention allows isolation of individual rotating extensions such as a single gear tooth). In this respect the present invention as claimed provides far more specific information that is provided by Dister et al. Thus, the rejections of dependent claim 49 over Dister et al. should be withdrawn.

Claims 1, 2, 4-9, 14-18, 20-28, 30-35, 37-41, 47-51, 53-61 and 63-66 were rejected under 35 U.S.C. §102(a) as being anticipated by Cusumano et al. (U.S. Pat. No. 6,567,752).

Cusumano et al. discloses a method and apparatus for tracking the evolution of hidden damage or otherwise unwanted changes in machinery components and predicting remaining useful life. According to Cusumano et al., "fast" subsystem data is gathered to predict "slow" subsystem data, which allows monitoring of slow-to-develop damage. (Cusumano et al., col. 1, ll. 12-17; col. 4, ll. 6-26). In FIG. 2 of Cusumano et al., a test system 200 and a cantilevered beam 205 are shown, with the beam 205 constituting a test object attached to a strain gauge 220 and a shaker 225 of the system 200. (Cusumano et al., col. 11, ll. 22-36; FIG. 2).

Cusumano et al. fails to show, teach or disclose each and every element of amended independent claims 1, 34 and 67 because Cusumano et al. fails to show, teach or disclose any apparatus or method for measuring and transmitting the two distinct types of data required by those claims: (a) resonant vibration and bending amplitude data derived as a function of a transit time between individual rotating extensions of the rotating machinery and (b) distance data derived from signal amplitude data for a proximeter signal. As discussed above with respect to the rejections over Dister et al., independent claims 1, 34 and 67 have both been amended to further clarify that resonant vibration and bending amplitude data relates to a characteristic of the rotating machinery derived in the time domain, while the distance data derived from the signal amplitude data, in contrast, is produced when the proximeter signal is sensed to detect relative positioning between a proximeter and the rotating machinery at a given instant. Furthermore, independent claims 1 and 34 have been amended such that a resonance period must be measured, rather than "substantially and entire resonance period" as previously recited.

At page 8, the Office Action asserts that Cusumano et al discloses mapping substantially entire resonance period of rotating machinery (*citing* Cusumano et al., FIG. 4). However, FIG. 4 of Cusumano et al. does not relate to vibrations or resonant frequencies. Instead, FIG. 4 of Cusumano et al. shows estimated damage stat and remaining useful life plotted against time. (Cusumano et al., col. 3, ll. 64-67; FIG. 4). Those graphs of Cusumano et al. disclose nothing about mapping a resonance period as required by amended independent claims 1 and 34.

Thus, Cusumano et al. fails to show, teach or disclose each and every limitation of amended independent claims 1, 34 and 67, and the rejections under §102 should be withdrawn. Notification to that effect is requested.

Claims 2, 4-9, 14-18, 20-28 and 30-33 depend from independent claim 1 and include all of the limitations of that base claim, and claims 35, 37-41, 47-51, 53-61 and 63-66 depend from independent claim 34 and include all of the limitations of that base claim. For the reasons detailed above with respect to independent claims 1 and 34, all of the dependent claims 2, 4-9, 14-18, 20-28, 30-33, 35, 37-41, 47-51, 53-61 and 63-66 are also allowable over the cited art, and the rejections under §102 should likewise be withdrawn.

In addition, Cusumano et al. fails to show, teach or disclose many limitations recited in the pending dependent claims. The following are some examples.

Regarding dependent claims 4 and 37, Cusumano et al. does not show, teach or disclose measurement of radial runout. The meaning of the term "radial runout" is discussed above. The Office Action cited a passage in Cusumano et al. against claims 4 and 37 that discusses crack growth in a shaft. (Office Action, p. 8, *citing* Cusumano et al., col. 4, ll. 35-42). Crack growth monitoring is unrelated to radial runout data (either under the definition given above or the definition proffered on page 4 of the Office Action). Cusumano et al. therefore fails to show, teach or disclose resonant vibration data that includes radial runout data for a shaft having circumferentially disposed extensions, where the resonant vibration data is derived from transit times between individual rotating extensions. Thus, the rejections of dependent

claims 4 and 37 over Cusumano et al. should be withdrawn. Likewise, Cusumano et al. fails to show, teach or disclose runout data as required by dependent claims 5, 6, 38 and 39.

Regarding dependent claims 7-9, 40 and 41, Cusumano et al.does not show, teach or disclose measurement, transmittal or correlation involving axial movement data, which can be axial runout data, shaft elongation data, or other data indicative of axial fluctuations in position. Such movement data is distinguishable from mere vibration data of the kind disclosed by Cusumano et al. Contrary to the assertions in the Office Action, Cusumano et al. does not show, teach or disclose those claim limitations. The passages of Cusumano et al. cited in the Office Action fail to disclose any data relating to axial movement. (Office Action, p. 8, *citing* Cusumano et al., col. 3, ll.22-31, col. 4, ll. 31-42 and col. 12, ll. 58-65). Thus, the rejections of those claims over Cusumano et al. should be withdrawn.

Regarding dependent claims 14 and 47, Cusumano et al. fails to show, teach or disclose multiple proximeters positioned in such as way to measure ans transmit nonduplicative resonant vibration and bending amplitude data for multiple rotating machinery components. The Office Action make a general reference to "[r]efer to figure 2" of Cusumano et al. However, FIG. 2 of Cusumano et al. merely discloses a *single* strain gauge 220 connected to a *single* component being tested (cantilevered beam 205). Such disclosure by Cusumano et al. is insufficient to teach or suggest the claimed invention. Thus, the rejections of claims 14 and 47 over Cusumano et al. should be withdrawn.

Regarding dependent claim 16, Cusumano et al. fails to show, teach or disclose proximeters oriented at about 90° to each other. Providing proximeters that are, for example, radially and axially oriented with respect to an axis of rotation of machinery facilitates monitoring desired operational health characteristics. (See, e.g., specification, ¶¶ 22, 23, 28, 41; FIGS. 1, 3a, 3b, 10). The Office Action does not provide any *prima facie* basis for such a disclosure by Cusumano et al. Rather, the Office Action discusses "a gearbox comprising a gear having multiple teeth," which is not a limitation found in dependent claim 16. Thus, the rejection of dependent claim 16 over Cusumano et al. should be withdrawn.

Regarding dependent claims 17 and 50, Cusumano et al. fails to show, teach or disclose a proximeter disposed at a location approximately 180° from a meshing point of two gears. Cusumano et al. does not show, teach or disclose the particular locations of proximeters in relation to rotating machinery required by those claims. The portions of the Cusumano et al. reference cited in the Office Action fail to disclose the relevant claim language. Rather, Cusumano et al. discloses "gears with failing teeth", but fails to discuss gear meshing points or the particular angular locations of proximeters with regard to such a meshing point. (See Cusumano et al., col. 3, ll. 25-30). Thus, the rejections of dependent claims 17 and 50 over Cusumano et al. should be withdrawn.

Regarding dependent claims 18 and 51, Cusumano et al. fails to show, teach or or disclose a housing having an interior space in which said rotating machinery is disposed, or a wall defining at least a portion of said interior space and separating said proximeters from said rotating machinery. The Office Action cites FIG. 2 of Cusumano et al., however, that figure depicts a cantilevered beam 205 that is the rotating machinery being tested with the strain gauge 220. The cantilevered beam 205 is no disposed in an interior space of a housing, nor does a wall separate the strain gauge 220 from the cantilevered beam 205. Thus, the rejections of dependent claims 18 and 51 over Cusumano et al. should be withdrawn.

Regarding dependent claims 21 and 54, Cusumano et al. fails to show, teach or disclose comparing *measurements* against predetermined values to assess machinery operational health. Rather, Cusumano et al. discloses comparing a remaining-time-to-failure *calculation* against a predetermined threshold value. (Cusumano et al., col. 1, ll. 44-49; col. 13, ll. 39-43). In other words, Cusumano et al. only discloses a comparison to a predetermined value after machinery operational health has been assessed (to obtain the remaining-time-to-failure calculation from measurements). Thus, the rejections of dependent claims 21 and 54 over Cusumano et al. should be withdrawn.

Regarding dependent claims 25 and 58, Cusumano et al. fails to show, teach or disclose predetermined values that comprise values for a radial gap between a gear tooth and a housing in which said gear tooth is housed. The Office Action cites a passage of Cusumano et al. that states its invention is

applicable to "gears with cracking teeth." (Office Action p. 10, *citing* Cusumano et al., col. 3, ll. 27-30). However, that disclosure by Cusumano et al. is insufficient to disclose, teach or suggest the particular predetermined radial gap values recited by the present claims. Cusumano et al. fails to disclose anything about radial gaps. Thus, the rejections of dependent claims 25 and 58 over Cusumano et al. should be withdrawn.

Regarding dependent claims 27 and 60, Cusumano et al. fails to show, teach or disclose an alerting signal that comprises instructions for maintaining rotating machinery. The Office Action cites a passage in Cusumano et al. that discusses storing program instructions (i.e., software) on a computer readable storage medium for executing testing methods. This disclosure by Cusumano et al. does not relate to an alert or warning that includes instructions *for maintaining rotating machinery* as recited by the present claims. Thus, the rejections of dependent claims 27 and 60 over Cusumano et al. should be withdrawn.

Regarding dependent claims 30-32 and 63-65, Cusumano et al. fails to show, teach or disclose any detection of machinery chatter, nor any assessment based upon machinery chatter. The Office Action refers to portions or Cusumano et al. that disclose measurements of vibration frequencies and time-to-failure estimates. (Office Action p. 11, *citing* Cusumano et al., col. 12, ll. 61-62 and col. 13, ll. 35-38). However, those cited passages fail to disclose anything about machinery chatter, which is a parameter distinguishable from vibration frequencies and time-to-failure estimates. Thus, the rejections of dependent claims 30-32 and 63-65 over Cusumano et al. should be withdrawn.

Regarding dependent claims 33 and 66, Cusumano et al. fails to show, teach or disclose spacing proximiters at odd harmonics of the resonance frequency quarter wavelength of teeth of a gear having multiple teeth. Cusumano et al. does not disclose resonance frequencies of gears in a gearbox being monitored, or positioning proximeters at odd harmonics of the resonance frequency quarter wavelength for gear teeth. Dependent claims 33 and 66 suggest a specific configuration of proximeters not contemplated

or suggested by Cusumano et al. Thus, the rejections of dependent claims 33 and 66 over Cusumano et al. should be withdrawn.

Regarding dependent claim 49, Cusumano et al. fails to show, teach or disclose asessing operational health of each tooth of a gear having multiple teeth. Cusumano et al. discusses identifyinggears with faulty teeth, but the present invention allows isolation of individual rotating extensions such as a single gear tooth). In this respect the present invention as claimed provides far more specific information that is provided by Cusumano et al., in allowing identificaiton of particular teach that may have operational health issues Thus, the rejections of dependent claim 49 over Cusumano et al. should be withdrawn.

Claim Rejections - 35 U.S.C. §103(a)

Claims 29 and 62 were rejected under 35 U.S.C. §103(a) as being obvious over Cusumano et al. in view of Discoenzo (U.S. Pat. No. 6,847,854).

To establish a *prima facie* case of obviousness under 35 U.S.C. §103, the rejections must rest on a factual basis. In making such a rejection, the examiner has the initial duty of supplying the requisite factual basis, and may not rely upon speculation, assumption or hindsight reconstruction to supply deficiencies in the factual basis. *In re Warner*, 37 F.2d 1011, 1017 (CCPA 1967), *cert denied*, 389 U.S. 1057 (1968). Furthermore, obviousness rejections "cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. ____ (2007) (*quoting In re Kahn*, 441 F. 3d 977, 988 (Fed. Cir. 2006)). This reasoning should be made explicit, and it is "important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the [cited prior art] elements in the way the claimed new invention does. This is so because inventions in most, if not all, instances rely upon building blocks long since uncovered, and claimed discoveries almost of necessity will be combinations of what, in some sense, is already known." *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. ____ (2007).

Claim 29 depends from amended independent claim 1 and includes all of the limitations of that base claim, and claim 62 depends from amended independent claim 34 and includes all of the limitations of that base claim. As discussed above with respect to the rejections under §102(a), amended independent claims 1 and 34 are patentable over Cusumano et al. Discoenzo does not supply the teaching lacking in Cusumano et al. Accordingly, dependent claims 29 and 62 are also patentable over the cited art. The rejections under §103 should be withdrawn. Notification to that effect is requested.

CONCLUSION

All of the pending claims are now in condition for allowance. Notification to that effect is requested. If it would in any way facilitate prosecution, the examiner is invited to contact the undersigned at the telephone number provided below. The Commissioner is authorized to charge any additional fees associated with this paper or credit any overpayment to Deposit Account No. 11-0982.

Respectfully submitted,

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